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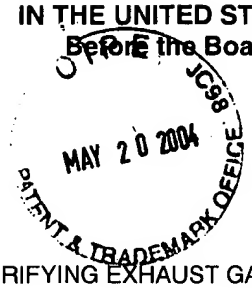
1725

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
Before the Board of Patent Appeals and Interferences



In re Patent Application of — Atty Dkt. 1035-303
C# M#

OKUMURA et al — TC/A.U.: 1725

Serial No. 09/778,103 — Examiner: Ildebrando

Filed: February 7, 2001 — Date: May 20, 2004

Title: CATALYST FOR PURIFYING EXHAUST GAS AND A PROCESS FOR PURIFYING EXHAUST GAS

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

☐ **Correspondence Address Indication Form Attached.**

☐ **NOTICE OF APPEAL** Applicant hereby **appeals** to the Board of Patent Appeals and Interferences from the last decision of the Examiner. ($ 330.00)	$	
☒ An appeal **BRIEF** is attached in triplicate in the pending appeal of the above-identified application ($ 330.00)	$	330.00
☐ Credit for fees paid in prior appeal without decision on merits	-$ (	)
☐ A reply brief is attached in triplicate under Rule 193(b)		**(no fee)**
☒ Petition is hereby made to extend the current due date so as to cover the filing date of this paper and attachment(s) (**$110.00/1 month**; $420.00/2 months; **$950.00/3 months**; $1480.00/4 months)	$	420.00
SUBTOTAL	$	750.00
☐ Applicant claims "Small entity" status, enter ½ of subtotal and subtract ☐ "Small entity" statement attached.	-$(	)
SUBTOTAL	$	750.00
Less month extension previously paid on	-$(	0.00)
TOTAL FEE ENCLOSED	$	750.00

Any future submission requiring an extension of time is hereby stated to include a petition for such time extension. The Commissioner is hereby authorized to charge any deficiency, or credit any overpayment, in the fee(s) filed, or asserted to be filed, or which should have been filed herewith (or with any paper hereafter filed in this application by this firm) to our **Account No. 14-1140.** A duplicate copy of this sheet is attached.

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
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In re Patent Application of

OKUMURA et al — Atty. Ref.: 1035-303

Serial No. 09/778,103 — TC/A.U.: 1725

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* *

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APPEAL BRIEF

Sir:

Applicant hereby appeals to the Board of Patent Appeals and Interferences from the last decision of the Examiner. A notice of appeal was filed on January 26, 2004. A petition with appropriate fee for a two month time extension is made to file the brief.

REAL PARTY IN INTEREST

The real parties in interest are ICT Co., LTD, a corporation of the country of Japan and International Catalyst Technology, Incorporated a corporation of the country of Japan.

RELATED APPEALS AND INTERFERENCES

The appellant, the undersigned, and the assignee are not aware of any related appeals or interferences which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

STATUS OF CLAIMS

Claims 18 to 23 are pending, have been rejected and are on appeal. No claims have been allowed.

Claims 1 to 17 were cancelled.

STATUS OF AMENDMENTS

An after final amendment submitted on January 26, 2004, was denied entry in an Advisory Action of February 18, 2004.

SUMMARY OF INVENTION

Exhaust gases from cars and trucks generally include hydrocarbons (HC), carbon monoxide(CO) and nitric oxides (NOx) gases. Reduction of these gases, especially the NOx, is difficult when the exhaust gases also include excessive oxygen such as from lean-burn engines in current day cars and diesel trucks. Spec. p. 2, lns., 6-16. Conventional methods for reducing NOx in an oxidizing environment, i.e., oxygen rich, tend to lack durability and suffer when exposed to hot gases over a wide operating range, such as 200°C to 700°C.

Applicants discovered an exhaust gas purifying catalyst having iridium and sulfur which provides oxidizing activity for HC and CO, reduces NOx efficiently, and has high heat resistance and durability over a wide operating range. Spec. p. 9, ln. 7 to p. 10, ln. 7

(summary of invention); p. 77, ln. 6 to p. 80, ln. 6 (industrial applicability of catalyst); *see also*, Spec. p. 7, ln. 6 to p. 9, ln. 5 (for descriptions of shortcomings of prior art).

The claimed exhaust gas purifying method includes: (i) preparing a catalyst; (ii) setting an exhaust gas temperature between 200°C to 700°C at the inlet of the catalyst, and (iii) directing the exhaust gas from an internal combustion engine through the catalyst to reduce NOx in the exhaust gas.

The catalyst is formed of iridium, a rare earth metal oxide and sulfur. With respect to claims 18 and 19, the iridium forms a complex oxide with at least one of calcium, strontium and barium. With respect to claims 20 to 23, the rare earth metal oxide is at least one of cerium, lanthanum, yttrium, neodymium and praseodymium. Claims 22 and 23 further require the catalyst to include at least one of manganese, iron, cobalt, nickel, copper and zinc. Support for these claims is in claim 18 as originally filed.

The iridium serves as a catalyst to promote NOx reduction in an oxidizing atmosphere. The iridium is deposited on a support impregnated with sulfur, preferably a sulfate. The catalyst activity of the iridium is enhanced by the sulfur, even though sulfur alone does not promote NOx reduction. Spec. p. 9, lns. 7-23. The sulfur accelerates the catalytic function of iridium and, thus, enables the catalyst to function over a wide temperature range. Spec. p. 32, lns. 17-22. The sulfur may be an inexpensive metallic sulfate. Spec. p. 32, lns. 10-23. Alkaline earth metal sulfates, such as calcium sulfate, strontium sulfate and barium sulfate, are suitable sources of sulfur.

With respect to claims 18 and 19, calcium, strontium and/or barium is included in the catalyst as a complex oxide of iridium. See e.g., spec. p. 29, lns. 3-12. These complex

iridium oxides ($CaIrO_3$, $Sr_xIr_xO_x$ and Ba_xIrO_x) provide a source of iridium for the catalyst. Spec. p. 29, lns. 3-12.

In addition, a rare earth metal, such as cerium, lanthanum, yttrium, neodymium and/or praseodymium, may be in the catalyst composition. The rare earth metal increases the temperature range of the catalyst. Spec., p. 33, lns. 14-23. The durability and wide temperature range of the catalyst is shown by the test results presented in Table 3 at page 68.

"With this composition, the catalyst exhibits a higher catalyst activity for removing NOx in a wider temperature range in an oxidizing atmosphere, has superior heat-resistance and durability especially in a high-temperature range, and makes it possible to suppress the variation of optimum temperatures of exhaust gas for the catalyst activity, and also to reduce costs; thus, the catalyst becomes suitable for practical use." Spec. p. 78, ln. 23 to p. 79, ln. 13.

This application is a divisional of a parent application that has issued as U.S. Patent 6,214,307, with claims directed to the structure of a catalyst for purifying exhaust gas.

ISSUES

1. Whether the catalyst recited in claims 21 and 22 is anticipated by the catalyst disclosed in Nakatsuji et al (EP 0 624,393 – Nakatsuji).

2. Whether the catalyst recited in claims 18 to 23 is obvious in view of the catalyst disclosed in Lauder (US Patent 4,049,583) and Shigeru (Japanese Patent Application 7-80315).

GROUPING OF CLAIMS

Group I – Claims 20 and 21 of which claim 21 is representative.

Group II – Claims 22 and 23 of which claim 23 is representative. If Group I is patentable so should be Group II. The claims of Group II include the limitations of Group I and add a limitation for manganese, iron, cobalt, nickel, copper or zinc.

Group III – Claims 18 and 19 of which claim 19 is representative.

ARGUMENT

The rejections stated in the Final Action on appeal should be reversed because the rejections fail to make out a prima facie case of anticipation or obviousness, and are based on an incorrect characterizations of the applied prior art and misapplications of the patent laws.

I. Nakatsuji Does Not Disclose Any One Catalyst With Iridium, Rare-Earth Metal and Sulfur.

The rejection of claims 21 (Group I) and 22 (Group II) as being anticipated by Nakatsuji et al (EP 0 624 393 -- Nakatsuji) should be reversed because Nakatsuji does not disclose the claimed catalyst having iridium, a rare-earth metal and sulfur.

Nakatsuji does not disclose sulfur in a catalyst also having iridium and a rare-earth metal oxide. Further, Nakatsuji does not disclose setting an exhaust gas temperature within a range of 200°C to 700°C, directing the exhaust gas to the catalyst and purifying the gas with the catalyst, as is recited in claim 21.

Claim 21 (Group I) defines an exhaust-gas purifying process comprising (among other steps): preparing a catalyst comprising iridium, a rare-earth metal and **sulfur**,

wherein the rare-earth metal is an oxide containing at least one element selected from a group consisting of cerium, lanthanum, yttrium, neodymium and praseodymium. Claim 21 (Emphasis Supplied).

Claim 22 (Group II) is similar to Group I, and also requires the rare earth metal to be an oxide containing at least one of cerium, lanthanum, yttrium, neodymium and praseodymium.

Nakatsuji discloses several catalysts for NOx reduction, only one of which includes iridium. The one iridium containing catalyst (B-33) disclosed in Nakatsuji has cerium oxide and iridium on a support of "H-ZSM-5 powder" which is SiO_2/Al_2O_3. *See* Nakatsuji, example A7 at col. 6, lns 63-67 (which defines the H-ZSM-5 power as SiO_2/Al_2O_3). The B-33 catalyst does not have sulfur. There is no suggestion in Nakatsuji to include sulfur in a catalyst that also has iridium.

That Nakatsuji does not disclose a catalyst with both iridium and sulfur is alone sufficient reason to reverse the anticipation rejection. "[A]nticipation requires that all of the elements and limitations of the claim are found within a single prior art reference. There must be no difference between the claimed invention and the reference disclosure, as viewed by a person of ordinary skill in the field of the invention." *Scripps Clinic & Research Foundation v. Genentech Inc.*, 18 USPQ2d 1001, 1010 (Fed. Cir. 1991).

Further, the general disclosure in Nakatsuji of catalysts does not constitute an anticipating disclosure of the specific catalysts recited in claims 21 and 22. For a prior art disclosure of a generic chemical compound to anticipate a specific chemical

compound, a person of ordinary skill must at once envisage the specific claimed compound from the generic disclosed compound. MPEP 2131.02 states:

> If one of ordinary skill in the art is able to "at once envisage" the specific compound within the generic chemical formula, the compound is anticipated. One of ordinary skill in the art must be able to draw the structural formula or write the name of each of the compounds included in the generic formula before any of the compounds can be "at once envisaged." One may look to the preferred embodiments to determine which compounds can be anticipated. *In re Petering*, 301 F.2d 676, 133 USPQ 275 (CCPA 1962). [1]

The disclosure of a catalyst with sulfur (TiO_2/SO_4^{2-} and ZrO_2/SO_4^{2-}) in Nakatsuji is made in the context of an oxide other than iridium. Nakatsuji, col. 17, lns. 5-30. The one iridium catalyst example (B-33) given in Nakatsuji uses a non-sulfur carrier. There is no teaching in Nakatsuji that sulfur is advantageous in the catalysts disclosed therein or that sulfur would be particularly useful in a catalyst that also included iridium. A skilled person would not have at once envisaged using a sulfur based carrier instead of H-25M-5 in the B-33 catalyst disclosed in Nakatsuji.

The anticipation rejection is premised on modifying Nakatsuji's B-33 catalyst to have sulfur rather than the non-sulfur SiO_2/Al_2O_3 carrier that is disclosed.

A proper anticipation rejection must be based on the actual disclosure in the prior art reference without modification. It is improper to modify a prior art disclosure to support an anticipation rejection.

> The law of anticipation requires that the same invention, with all the limitations of the claims, existed in the prior art. See

[1] MPEP 2131.2 states a less restrictive standard for anticipation that is stated in CAFC case law that requires an anticipating reference to disclose the identically same subject matter as is recited in a claim. The term "at once envisage" should not be applied - - as is done in the rejection - - as a means for modifying the prior art under the pretext of an anticipation rejection.

> Richardson v. Suzuki Motor Co., 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920-21 (Fed. Cir. 1989) ("anticipation" requires that the identical invention be described in a single prior art reference). **A prior art device can not be altered by the Board and then found to anticipate a different invention in whose image it was recreated.** (*In re Schreiber*, 44 USPQ2d 1429 (Fed. Cir. 1997)(Emphasis supplied)).

Further, the catalysts disclosed in Nakatsuji do not include manganese, iron, cobalt, nickel, copper and zinc as is recited in claim 22 (Group II). These elements are not included in the B-33 catalyst of Nakatsuji.

The anticipation rejection should be withdrawn because the Nakatsuji does not disclose the exact same catalyst as recited in claims 21 and 22.

II. Lauder and Shigeru Do Not Disclose or Suggest A Catalyst With Iridium, Rare-Earth Metal and Sulfur

The rejection of claims 18-23 (Groups I and II) as being obvious over Lauder (U.S. Patent No. 4,049,583) in view of Shigeru et al. (Japanese Patent Publication 7-80315 - Shigeru) should be reversed. Lauder and Shigeru do not disclose or suggest the claimed catalyst which includes sulfur.

Lauder discloses a catalyst that lacks sulfur. The catalyst disclosed by Lauder has an ABO_3 crystal structure. Lauder, col. 2, ln. 63 to col. 2, ln. 5. This ABO_3 structure does not include sulfur. It would not have been obvious to modify or abandon the ABO_3 crystal structure to form the claimed invention.

The A sites of the compound are occupied by cations of at least two different metals each occupying at least 1% of the Type A cation sites and having an ionic radius between 0.8 and 1.65 A. About 1% up to about 20% of the sites of the Type B element

are occupied by ions of platinum group metals. The remaining sites of the Type B element in the ABO_3 crystal structure are occupied by ions of non-platinum group metals having ionic radii between about 0.4 and 1.4 A. There is no suggestion in Lauder to add sulfur to the catalyst.

Lauder teaches that the ABO_3 crystal structure is preferable to other metal oxide compounds. Lauder, col. 1, ln. 63 to col. 2, ln. 21. Lauder states that "[t]he compounds of this invention require the presence of platinum group metals" arranged in the Type B sites of the ABO_3 crystal structure. Lauder, col. 2, lns. 23-51. Lauder teaches away from catalysts not arranged in the ABO_3 crystal structure by stating that:

> "relatively short-lived, apparently because of either the formation of relatively volatile oxides (osmium and ruthenium), because of changes in crystallite particle size or surface properties, or because of interaction with various components of exhaust gases in ways which reduce their catalytic activity (for instance by forming catalytically less active compounds or alloys and by forming volatile halide compounds); and are unsatisfactory in other ways." [Lauder, col. 1, lns. 51-60].

By teaching away from non-ABO_3 catalysts, Lauder cannot be properly applied to reject a non-ABO_3. *In re Gurley*, 31 USPQ2d 1130 (Fed. Cir. 1994)(" A reference may be said to teach away when a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant."). A person of ordinary skill in the art would be lead away by Lauder from catalysts that do not have an ABO_3 crystal structure, such as the claimed catalyst.

In contrast to Lauder, the catalyst recited in claims 18-23 does not have the special ABO_3 crystal structure. Sulfur is not a constituent of the ABO_3 crystal structure disclosed in Lauder. The catalysts disclosed in this application do not have the ABO_3 crystal structure. The claims require a catalyst with sulfur. It is believed that the ABO_3 crystal structure is not useful to form the claimed invention. Accordingly, the ABO_3 crystal structure disclose in Lauder would not be suitable to form the claimed catalysts.

Shigeru does not disclose a catalyst including a metallic sulfate having iridium deposited thereon. Shigeru does not teach adding sulfur to the ABO_3 structured catalyst disclosed in Lauder. There is no suggestion, teaching or motivation evident from the prior art to combine Lauder and Shigeru to create the claimed invention.

Further, when compositions are deposited on a catalyst the effects vary in accordance with the makeup of the compositions in unpredictable ways. In view of the uncertainties in this art, it would not have been obvious to a person of ordinary skill in the art to form the claim invention based on the teachings of Lauder and Shigeru. Accordingly, the rejection of claims 18 to 23 should be reversed.

CONCLUSION

In conclusion it is believed that the application is in clear condition for allowance; therefore, early reversal of the Final Rejection and passage of the subject application to issue are earnestly solicited.

Respectfully submitted,

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APPENDIX

CLAIMS ON APPEAL

Claims 1-17 (Cancelled)

18. An exhaust-gas purifying process comprising:

preparing a catalyst for purifying exhaust gas by forming the catalyst of iridium, a rare earth metal oxide, and sulfur; and at least one element selected from a group consisting of calcium, strontium and barium, as catalyst active substances, wherein the iridium forms a complex oxide with said at least one element;

setting an exhaust-gas temperature in a range of 200°C to 700°C at an inlet to the catalyst for purifying the exhaust gas; and

directing the exhaust gas from an internal combustion engine through the catalyst for purifying the exhaust gas so as to reduce nitrogen oxides in the exhaust gas.

19. An exhaust-gas purifying process comprising:

preparing a catalyst for purifying exhaust gas comprising by forming the catalyst of iridium, a rare earth metal oxide, and sulfur; and at least one element selected from a group consisting of calcium, strontium and barium, as catalyst active substances, wherein the iridium forms a complex oxide with said at least one element;

setting an exhaust-gas temperature in a range of 200°C to 700°C at an inlet to the catalyst for purifying the exhaust gas; and

directing the exhaust gas from an internal combustion engine through the catalyst for purifying the exhaust gas so as to reduce hydrocarbons, carbon monoxide and nitrogen oxides in the exhaust gas from the internal combustion engine.

20. An exhaust-gas purifying process comprising:

preparing a catalyst comprising iridium, a rare-earth metal and sulfur, wherein the rare-earth metal is an oxide containing at least one element selected from a group consisting of cerium, lanthanum, yttrium, neodymium and praseodymium;

setting an exhaust-gas temperature in a range of 200°C to 700°C at an inlet to the catalyst for purifying exhaust gas; and

directing an exhaust gas from an internal combustion engine through the catalyst to purify the exhaust gas and reduce nitrogen oxides in the exhaust gas.

21. An exhaust-gas purifying process comprising:

preparing a catalyst comprising iridium, a rare-earth metal and sulfur, wherein the rare-earth metal is an oxide containing at least one element selected from a group consisting of cerium, lanthanum, yttrium, neodymium and praseodymium;

setting an exhaust-gas temperature in a range of 200°C to 700°C at an inlet to the catalyst; and

directing an exhaust gas from an internal combustion engine to pass through the catalyst for purifying exhaust gas so as to reduce hydrocarbons, carbon monoxide and nitrogen oxides in the exhaust gas from the internal combustion engine.

22. An exhaust-gas purifying process comprising:

preparing a catalyst comprising iridium, a rare-earth metal and sulfur, wherein the rare-earth metal is a composite oxide containing at least one element selected from a group consisting of cerium, lanthanum, yttrium, neodymium and praseodymium, and at

least one element selected from a group consisting of manganese, iron, cobalt, nickel, copper and zinc;

setting an exhaust-gas temperature in a range of 200°C to 700°C at an inlet to the catalyst for purifying exhaust gas; and

directing an exhaust gas from an internal combustion engine through the catalyst to purify the exhaust gas and reduce nitrogen oxides in the exhaust gas.

23. An exhaust-gas purifying process comprising:

preparing a catalyst comprising iridium, a rare-earth metal and sulfur, wherein the rare-earth metal is a composite oxide containing at least one element selected from a group consisting of cerium, lanthanum, yttrium, neodymium and praseodymium, and at least one element selected from a group consisting of manganese, iron, cobalt, nickel, copper and zinc

setting an exhaust-gas temperature in a range of 200°C to 700°C at an inlet to the catalyst; and

directing an exhaust gas from an internal combustion engine to pass through the catalyst for purifying exhaust gas so as to reduce hydrocarbons, carbon monoxide and nitrogen oxides in the exhaust gas from the internal combustion engine.